COURSE OUTLINE

(1) GENERAL

SCHOOL	Economy, Management and Informatics		
ACADEMIC UNIT	Department of Informatics and Telecommunications		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE		**SEMESTER**	
COURSE TITLE	Earth System Science		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		**WEEKLY TEACHING HOURS**	**CREDITS**
Courses			
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).			
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	TBA		

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(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

This course deals with topics in the science of several aspects of the earth system for which Earth Observations are widely applied.
Upon successful completion of the course, students will be able to:
- Describe the basic physical processes encountered within each earth subsystem (ocean, atmosphere, land), as well as the interactions in between them.
- Understand the basic principles of the earth's climate from the short term weather modulation to climate variability and climate change.
- Identify the factors that drive climate change and explain its links with subsequent natural hazards.
- Recognize the significance and interrelations of the different earth's natural cycles.
- Understand balances in earth's energy budget.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
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Others…
…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology.
- Working independently
- Working in an interdisciplinary environment
- Production of new research ideas
- Respect for the natural environment
- Production of free, creative and inductive thinking
- Decision-making

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(3) SYLLABUS

1. The Ocean – Atmosphere – Land system:
- General Circulation in the Atmosphere
- Climate Zones
- Known Atmospheric Oscillations
- Oceanic Currents, Thermohaline Circulation
- Land Data Systems
- Land-Atmosphere Interactions, Ocean-Atmosphere Interactions

2. Weather and climate:
- Past-Current-Future Climate, Climate Variability, Climate Change, Anthropogenic and Natural Climate Cycles
- Natural Hazards
- Greenhouse and Trace Gases, Aerosols and Clouds, Global Warming and Dimming
- Weather Systems, Extreme Weather Events, Weather Forecast, Meteorological Parameters

3. Earth's natural cycles:
- Carbon Cycle, Water/Hydrological Cycle
- Water Balance, Soil Moisture, Evapotranspiration

4. Earth's energy budget:
- Surface/atmospheric energy budget and heat fluxes.

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(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Use of ICT teaching - Communication with students
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	***Activity Semester workload*** 39 Lectures 2 Seminars 55 Tutorials/Interactive teaching 10 study and analysis of bibliography 81 Studying 3 Educational visits 190 Course total

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Final examination (~70%) consisting of - Problem solving questions - Theory understanding short questions - Short-answer questions Project examination and presentation (~30%)

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(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

Books:

1. P. Lionello, P. Malanotte-Rizzoli and R. Boscolo (Ed.),The Mediterranean Climate: an overview of the main characteristics and issues, Elsevier, 27-148, 2006.
2. Lionello, P. (Ed.), The Climate of the Mediterranean region: From the Past to the Future. Elsevier, Amsterdam, The Netherlands, pp. 87-185, 2012.
3. Wallace & Hobbs, Atmospheric Science, 2nd Edition, An Introductory Survey, Academic Press, pp. 504 2006, eBook ISBN : 9780080499536, Print Book ISBN:9780127329512
4. W. Zdunkowski, T. Trautmann, A. Bott, Radiation in the Atmosphere: A Course in Theoretical Meteorology, Cambridge Univ. Press, 2007, ISBN: 9780521871075
5. J.P. Peixoto and A.H. Oort, Physics of Climate, American Institute of Physics, 1992, pp. 520
6. H.J. Schellnhuber, W. Cramer, N. Nakicenovic, T. Wigley, G. Yohe, (Ed.), Rajendra Pachauri (intro), Avoiding Dangerous Climate Change, 2006, ISBN: 9780521864718
7. H.B. Bluestein, Synoptic-Dynamic Meteorology in Midlatitudes: Volume II: Observations and Theory of Weather Systems, Oxford University Press, USA, 1993, ISBN 10: 019506268X, ISBN 13: 9780195062687
8. T. E. Graedel, P.J. Crutzen, Atmospheric Change: An Earth System Perspective, New York, NY (United States); W.H. Freeman and Co., 1993
9. J. Seinfeld and S. Pandis, Atmospheric Chemistry and Physics, From Air Pollution to Climate Change, 2nd Edition, Wiley, 2006, ISBN: 978-0-471-72018-8

Journals:

1. Global Biogeochemical Cycles, AGU Pubs
2. Nature Climate Change, Nature Publishing Group (NPG)
3. Atmospheric Chemistry and Physics, EGU/Copernicus Pubs
4. Journal of Geophysical Research, AGU Pubs
5. Geophysical Research Letter, AGU Pubs
6. Climatic Change, Springer Link
7. Earth Interactions, AMS
8. Quarterly Journal of the Royal Meteorological Society, Wiley-Blackwell/RMS

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